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ENERGY CONSERVATION

PRAVDA EXAMINES PROBLEMS OF SIBERIAN FUEL

PM111200 Moscow PRAVDA in Russian 1 Aug 83 First Edition pp 1-2

[Article by Academician A. Aganbegyan under the rubric "Problems and Judgments": "Siberia's Fuel"]

[Text] Novosibirsk--Half the country's fuel--more than 1 billion metric tons (in ideal fuel equivalent)--will be extracted in Siberia this year. According to the 1983 plan, it is planned to obtain here 60 percent of the all-union indicators for oil and condensate, 51 percent of the gas, more than one-third of the coal, and approximately 40 percent of all the electricity generated by the country's GES's. This is a tremendous victory for the planned socialist economy and the fruit of the purposeful efforts of the entire Soviet people. Such a portentous result has been achieved as a consequence of implementing the targeted all-state programs for opening up Siberia's natural riches.

It is a question, above all, of our country's biggest regional program--the formation of the West Siberian oil and gas complex. Our country's new oil base was created in a very short time in the uninhabited marshes in the north of Tyumen and Tomsk Oblasts. The annual increase in oil extraction in Tyumen Oblast during the first 3 years of the current 5-year plan will amount to approximately 20 million metric tons.

How can one not recall here the shortsighted CIA "forecasters" who predicted a fall in Siberian oil extraction at the beginning of the eighties and maintained that without Western technology our country would be unable to develop the oil industry on the scale that we need and would be forced to become an importer instead of an exporter of oil. The experience of the unprecedented pace and scale of the increase in oil extraction in West Siberia chiefly on the basis of Soviet equipment and technology has refuted those fabrications.

Natural gas extraction in the tundra zone of Tyumen Oblast has grown at a no less impressive pace. It is now increasing by 35-40 billion cubic meters annually there.

In no country has the oil and gas industry developed at such a fast pace as here in Siberia.

The truly giant efforts of our entire society lie behind all this. Hundreds of thousands of people were attracted to the north of Tyumen and Tomsk Oblasts from other parts of the country in a very short time. Large cities have been built: Surgut, Nizhnevartovsk, Nefteyugansk, Strezhevoy, Nadym, Novyy Urengoy, and others. The Tyumen-Tobolsk-Surgut-Nizhnevartovsk railroad and hundreds of kilometers of highways have been built. The Surgut GRES has been constructed, power transmission lines built, vast construction and production bases and large ports created....

The development of the West Siberian oil and gas complex is proceeding successfully, with the 5-year plan targets being exceeded. At the same time far from full use has yet been made of the resource potential of this oil and gas province. Here oil extraction will grow at least until the end of the century, while it is possible in the long term to obtain at least three times as much natural gas. The extraction of millions of metric tons of gas condensate--a very valuable raw material for the chemical industry and fuel production--will also begin in the very near future.

In cross section the West Siberian oil and gas province is like a multi-layered "cake" in which industrial extraction is being carried out so far chiefly in the upper layers, while hydrocarbon raw materials have also been discovered in the lower deposits. The tasks of developing the complex are becoming more complicated as the scale of production and of penetration to increasingly deep layers increases, particularly as the oil extraction regions are shifting northward.

The new conditions are making increased demands on all the organizations involved in opening up oil- and gas-bearing regions. It is necessary, above all, to ensure the increasing preferential pace of geological prospecting work. The stumbling block here is the increase in the volume of drilling. The potential of geological organizations is still rather limited. The Ministry of Petroleum Industry could give them assistance by increasing the volumes of exploratory drilling near the opened-up deposits of the Central Ob, so that the geological prospecting organizations can advance more quickly into the little-studied northern regions and increase the volume of wildcat-exploratory drilling above all. Tomorrow's oil extraction depends on the work of geologists, and it is necessary primarily to satisfy their needs.

The oil industry of West Siberia is currently going through a difficult period. Every year seven or eight new deposits have to be commissioned, and it is necessary to go more boldly into new regions. At the same time in existing fields there is a mass changeover of wells from gushing to forced extraction with the help of electric deep-well and sucker rod pumps and gas lift. The energy- and labor-intensiveness of well services and the volumes of capital and underground repairs are increasing. Tasks of intensifying oil extraction by using surfactants and other methods which increase the fullness of fuel extraction from the seam are being brought to the forefront. Under these conditions oil extraction is coming to depend increasingly on the contribution of support sectors and on the supply of

good-quality pipes for drilling, oil pipelines, and equipment for the forced extraction of oil. The volume of drilling work is increasing by 20-30 percent a year, and much here depends on the quality of the drilling rigs and the durability of the bits.

Quite a lot has been done recently in this respect. Uralmash has developed directional drilling rigs for West Siberia, production of Soviet gas lift equipment has begun, the flow of deliveries of electric deep-well pumps to West Siberia is increasing, and so forth. But the requirements are growing rapidly, and what was acceptable yesterday is no longer adequate today. Given such considerable volumes of drilling, the low quality of the drill pipes manufactured by Ferrous Metallurgy Ministry plants, which have to be rejected at bases in West Siberia, is intolerable. The same applies to electric deep-well pumps, each one of which has to be taken apart here, reassembled, and only then put down the well. The quality of the bits limits the drilling speed. And in order to save hundreds of millions of rubles it is advisable, in my view, to introduce special inspection of the materials and equipment being supplied for the West Siberian oil and gas complex at the manufacturing plants, at the same time giving these enterprises an interest in improving their product quality.

The production of specialized all-terrain equipment has not been organized, and oilmen and construction workers have been forced themselves to produce Tyumen all-terrain vehicles based on the K-701 tractor in small batches. Enthusiasts have built several hovercraft platforms with a carrying capacity of up to 40 metric tons, which have made a good name for themselves. A Finnish firm has begun manufacturing these platforms under license. But who will undertake to set up their series production in our country? There are many such questions. In order to "remove" them a targeted program should be adopted for the preferential development of a number of production sectors--above all, machine building and metallurgy--in the interests of the West Siberian oil and gas complex.

It is turning before our eyes into a gas and oil complex. In terms of the increase in extraction of hydrocarbon raw materials the gas industry (an increase of 40 billion cubic meters a year) has already overtaken the oil industry (an increase of 20 million metric tons). This demands a different attitude to the development of Siberia's gas industry than hitherto. Account should also be taken of the fact that natural gas extraction will begin next year in the zone of the Urengoy field located north of the Arctic circle. And a move into a still more northerly gas region--the Yamburg field--is on the agenda. And then it will be the turn of opening up the polar regions of the Yamal and Gyda peninsulas.

Everything there depends to a decisive degree on the increasing preferential construction of roads. However, the Ministry of Transport Construction is not coping with its tasks here. Only now is the construction of a road on the Medvezhye field being completed--at least 8 years late. Huge amounts have had to be spent additionally because projects have been constructed in an absence of roads. The same thing is being repeated on the Urengoy field.

Meanwhile, at the Ministry of Transport Construction subunits which have finished constructing individual sections of the Baykal-Amur Main Railroad are being released, and part of this force should be sent to the Tyumen north. The first such step is being taken. But this is just a timid beginning. Road trusts in many union republics are helping oilmen to build a road. This matter has taken off sharply, and yet little help is being given the gas workers.

The development of the fuel and energy complex will depend to a decisive degree on the rate of increase in gas extraction from the Yamburg field. Every month's delay over opening it up, according to our estimates, will result in a loss to the country of hundreds of millions of rubles. Once again everything here depends on the speediest building of a road--it must be begun without delay. The question of a large construction organization capable of assimilating the capital investments worth billions of rubles in this very difficult region should be resolved promptly. I believe that it is also necessary to start building a modern city there by way of broad patronal assistance.

Although there is very great potential for extending the extraction of oil, condensate, and gas in West Siberia, and precisely this region will provide an overwhelming proportion of the increase in the country's fuel and energy resources up to the year 2000, it is necessary to devote more and more attention in good time to preparing the new oil and gas province of East Siberia. The search for and prospecting of oil and gas fields are under way on the vast territory of the ancient Siberian platform between the Yenisey and the Lena. The 26th CPSU Congress decisions pointed to the need to accelerate this work.

Much has already been done. Flows of oil and gas have been obtained in a number of regions, and more than 20 oil and gas fields have been discovered. But a very great deal still remains to be done to organize the large-scale extraction of hydrocarbon raw materials. And once again the technical equipment and inadequate capacities of geological prospecting organizations remain a bottleneck. In my view, it would be useful to involve construction and transport workers in assisting them.

The Kuzbass is making a weighty contribution to the Siberian billion metric tons of fuel. This year it is planned to extract approximately 150 million metric tons of coal there. The Kuzbass workload is growing in connection with the reduction in Donetsk coal production in recent years. More and more coal is being transported from the Kuzbass to the European part of the country.

The Kuzbass' increasing share has a positive impact on indicators of national economic efficiency: Labor productivity in this basin is 100-150 percent higher than in the Donbass, while the prime cost of coal is half and the specific capital investments are one-third to one-fourth. It is, moreover, high-quality coal with a very low content of harmful impurities, sulfur, and phosphorus. In addition, 40-50 percent of the coal in the Kuzbass can

be extracted using the cheaper opencut method. And its reserves are colossal--723 billion metric tons, the overwhelming proportion of which is concentrated in inhabited regions.

You might think that under these conditions there is good reason for the USSR Ministry of Coal Industry to concentrate greater effort on extracting the highly efficient Kuzbass coal. Unfortunately, for the past 20 years the Kuzbass has been the only one of the country's large basins where the construction of not a single mine has been begun. The party's Central Committee and the government put the ministry right. Three years have passed since then, but so far no significant effort by the ministry is apparent. In particular, the planning of not a single new mine has been begun, modernization has lagged behind, and such a highly productive coal extraction method as the hydraulic method is not being developed. Construction bases are expanding only slowly, and coal machine building has lagged far behind. Housing and social-consumer construction is being carried out in a thoroughly bad way.

Siberia accounts for practically the country's entire increase in fuel. And three-fourths of the fuel being extracted is supplied from here to the European part of the country and to other regions. The tremendous national economic saving is gradually lost when it is transported thousands of kilometers, and this flow is increasing by 70-80 million tons a year.

The world's biggest transport system--above all, pipelines--has been created for the long-distance conveyance of such a huge amount of fuel. Five gas pipelines are being laid to the European part of the country from northern Tyumen during the 11th 5-Year Plan, while a sixth (Urengoy-Pomary-Uzhgorod) will send a flow of Siberian gas for export. Roughly speaking, 1 km of gas pipeline costs R1 million. Under these conditions it becomes cost-effective to concentrate energy-intensive production processes more and more in Siberia, near the sources of fuel.

The 26th CPSU Congress decision give a directive--not to site new energy-intensive production processes, as a rule, in European regions or expand existing ones, but to concentrate them in the regions of Siberia and Kazakhstan. The preferential development of the Siberian fuel and energy base and the buildup on this basis of energy-intensive production processes oriented toward the deep processing of available raw materials--this is the key aspect of economic strategy in the development of Siberia. And much has been and is being done in this direction.

The chief base of the country's aluminum industry is concentrated in Siberia, and the Sayanskiy Aluminum Plant is being constructed to supplement it. Metallurgical conversion is also developing successfully in other sectors. Energy-intensive sectors of the petrochemical industry are increasingly moving beyond the Urals: The large capacities of the Tomsk Chemical Plant are producing output in addition to the considerable expansion of the Omsk group of petrochemical enterprises and the Angarsk Association, the first production facilities of a future petrochemical giant--the

Tobolsk Combine--are being commissioned this year, the recently constructed Pavlodar and Achinsk oil refineries are being enlarged, and gas processing is being developed. Other sectors of the chemical industry, above all electrochemistry, are also strengthening. In the timber complex preference is given to timber processing and to pulp and hydrolytic production processes--also very energy-intensive. In recent years the Ust-Ilimsk Pulp Plant has been commissioned at full capacity with the participation of the CEMA countries, construction of the very big Bratsk hydrolytic plant for the production of fodder yeast has been started, and construction of a similar plant is soon to be started at Ust-Ilim. Important tasks are associated with the considerable development of the microbiological industry in Siberia on the basis of local timber and hydrocarbon raw materials.

At the same time, the development of energy-intensive production processes in Siberia has recently been slowed up in connection with laggardness in providing an electricity and heat supply. The thing is that specialists of the USSR Gosplan and the USSR Ministry of Power and Electrification have pursued a policy of constructing chiefly GES's in Siberia, while neglecting the construction of TETS's and GRES's and disbanding the corresponding collectives of construction workers. Because of this, a temporary shortage of electricity has arisen there. The construction of a number of TETS's is now taking place at an accelerated pace, and construction of the Berezovskaya GRES-1 has been started in the Kansk-Achinsk fuel and energy complex.

It is precisely the power stations of the Kansk-Achinsk fuel and energy complex that will in the long run solve the problem of a full electricity supply for the regions of Siberia with regard to creating large new energy-intensive production facilities. Coal from the Kansk-Achinsk fuel and energy complex will also be delivered to nearby Siberian centers. But the USSR Ministries of Coal Industry and Power and Electrification are not devoting sufficient attention to the Kansk-Achinsk fuel and energy complex: There is laggardness in the construction of the Berezovskiy No. 1 opencut mine and the corresponding GRES.

In my view, cardinal measures should be taken to improve the matter: it is necessary to form leadership of the Kansk-Achinsk fuel and energy complex program, for nonproduction construction, following the example of the Baykal-Amur main railroad and the West Siberian oil and gas complex, to involve major construction organizations in western regions of the country by way of patronage; to entrust production construction in the Kansk-Achinsk fuel and energy complex to the largest construction organization in Siberia--Bratskgestroy; to organize a second, additional stream of energy construction in the western sector of the Kansk-Achinsk fuel and energy complex, at Nazarovo, using the resources of Krasnoyarskgoestroy and patrons, enlarging the Nazarovo GRES, and increasing coal extraction there.

There is also the very acute question of energy supplies to the west Siberian oil and gas complex, whose power generation is not yet integrated with the united Siberian power system. The situation is being rectified: the powerful

Surgut GRES-2 is being constructed, and construction of the Nizhnevartovsk and Urengoy GRES' is on the point of getting properly under way.

It would also be advisable, in connection with the commissioning of the Kureyskaya GES, to construct a mighty power transmission fine from there to Tyumen Oblast and, in connection with the commissioning of the Kansk-Achinsk fuel and energy complex, to link Tyumen Oblast with the united Siberian power system by building super power transmission lines. Unfortunately, I have to mention the slow pace of construction of the Surgut GRES-2. The USSR Ministry of Power and Electrification did not create a strong construction base there in good time or attract workers, while nearby, at Norilsk, it groundlessly disbanded the large Taymyrgestroy construction organization instead of directing it to create energy installations in the north of Tyumen Oblast.

Speaking of power generation problems, I would like to draw attention to the technical standard of the solutions proposed--large-size boilers of old design are still being used in the construction of thermal electric power stations in Siberia. However, small steam generators with a swirling-type furnace are already being used successfully in our country. A reduction of 20-25 percent in capital expenditure and 25-40 percent in metal-intensiveness is achieved here, installation time is cut by a factor of 1.8-2, and there is a sharp fall in operating costs. At the Nazarovo GRES the small boiler of a unit with a capacity of 500 megawatts is working successfully on Kansk-Achinsk coal. At the same time, obsolete boilers are being installed in thermal electric power stations. Even the Berezovskaya GRES-1 has been planned in the old way, although the use of small boilers at this power station alone permits a saving of 155,000 metric tons of metal and capital investments worth R125 million and makes it possible to accelerate the station's commissioning by 2-3 years and secure a tanble fuel saving by reducing harmful discharges into the atmosphere.

The 26th CPSU Congress and the CPSU Central Committee June (1983) Plenum noted most forcefully the importance of transferring the national economy to the path of intensive development.

Siberia is making an ever increasing contribution to the economic potential at this crucial stage. Soviet people can take pride in a new target reached--the production of Siberia of 1 billion metric tons of fuel a year.

But we still have to resolve new and still more impressive tasks of developing the country's fuel and energy complex. The leading role in this matter belongs to Siberia.

CSO: 1822/317

NUCLEAR POWER

IZVESTIYA INTERVIEWS NUCLEAR POWER EXPERTS

PM311401 Moscow IZVESTIYA in Russian 20 Aug 83 Morning Edition p 2

[Interview with Academician V. A. Legasov, deputy director of the I.V. Kurchatov Institute of Atomic Energy, and Doctor of Technical Sciences A.S. Kochenov, laboratory chief at the institute--no date or place specified: "Reactors for the 21st Century"--first paragraph comprises an IZVESTIYA editorial introduction]

[Text] The future of our power industry lies above all with the utilization of the latest nuclear reactors, Comrade Yu. V. Andropov stressed in his speech at the CPSU Central Committee June Plenum. The IZVESTIYA editorial board asked scientists from the I. V. Kurchatov Institute of Atomic Energy to describe the latest work in this sphere. Taking part in the conversation were Academician V. A. Legasov, deputy director of the institute, and Doctor of Technical Sciences A. S. Kochenov, chief of one of its laboratories.

Question: Valeriy Alekseyevich, to start with, could you remind our readers of the advantages of nuclear power and why the prospects for the growth of the country's energy potential are linked with it.

Answer: The organic fuel (petroleum, gas, and coal) deposits in the USSR not only fully cover the development of our own power industry (and this not the case in any other industrially developed country) but also allow us to export petroleum and gas to East and West European countries.

The extraction of these energy sources, however, is highly labor-intensive. You see, the basic growth in fuel extraction is provided by the country's insufficiently developed eastern regions with harsh climatic conditions. High costs are also incurred in the transportation of fuel (and petroleum in particular) to the main consumers who are in the European part of the country.

Uranium, when used in modern thermal neutron reactors, releases 10,000 time more energy than an equal mass of petroleum when burned. Its transportation costs are extremely small and therefore the prime costs of energy from nuclear sources depends very little on the sources' location.

There is another advantage. Nuclear power production, taking into consideration the complete cycle of power production (starting with the extraction of fuel and ending with the maintenance of power station equipment) requires significantly less expenditure of labor resources than the conventional power industry.

Question: What is the share of nuclear power stations in today's electric power generation?

Answer: At present the nuclear power stations produce about seven percent of the electric power generated in the country. They, together with the Geses, just cover the future increase in electric power generation in the country's European part. Nuclear power stations are presently under construction in the north Western, Central and southern regions of the country's European part, as well as in the Volga region, the Transcaucasus and the Urals. Each one of them will have a capacity of between 4 and 6 million kilowatts. Power units with water-moderated water-cooled vessel reactors (VVER) [water-moderated water-cooled power reactors] and uranium graphite tube reactors (RBMK) [large-capacity boiler reactors] are being developed for them.

Question: In their letters, readers at times express doubts concerning the safety of nuclear power stations with regard to people and the environment. What would you say in this connection?

Answer: Nuclear power engineering is safer than conventional power engineering using organic fuel and less harmful for the environment.

Of course, deep inside the operational reactor there is a substantial amount of radioactive substances. This is why the development and operation of nuclear installations are based upon three fundamental principles. First of all, the external leakages must not change the natural background radiation. Then the probability of a major accident resulting in destruction of protective barriers and release of accumulated radioactivity must be close to zero. And finally, the radioactive waste (remaining after the nuclear fuel burnup) must be controlled at all stages, right up to its final burial for the prolonged period needed for the complete decay of all active isotopes.

The observations, in the course of many years, of the work of AESES built to our plans in the USSR and other countries prove their safety, as regards radiation, for the power station personnel, for the people living in the vicinity, and for the environment. Radioactive emissions from the power stations are so small that they cannot even be distinguished against the natural background radiation.

This stems from the fact that enormous attention was given to the problem of harmlessness and safety and substantial funds were invested in it.

Now that the nuclear power industry is developing at an unusually rapid rate and large numbers of new people are entering the sphere of nuclear power equipment manufacture and its management, it is especially important not to allow attention to slacken and to ensure reliable monitoring of the adherence to the three safety principles.

This is why a USSR State Committee for overseeing safe working operations in the nuclear power industry has been set up. This farsighted step is to ensure the maintenance of the level of safety achieved in the nuclear power industry during its manifold expansion.

Question: Please tell us about the new spheres of application for nuclear power engineering.

Answer: The solution of the country's fuel problems is linked with the expansion of the sphere of application of nuclear power engineering. One of the new directions is the use of nuclear power engineering within the centralized heating supply system. The country expends more organic fuel on the provision of heat than on the generation of electric power. This, furthermore, uses the fuels that are in the shortest supply: gas oil and fuel oil.

The assimilation of this new sphere of application of nuclear power engineering is proceeding in two directions. The first involves the development of nuclear heat supply stations (AST) [atomnaya stansiya teplosnabzheniya). These installations supply the consumers with hot water. The second envisages the construction of nuclear TETSES (ATETS) [automnaya TETS], which will combine the generation of heat with the production of electric power.

Practical experience has already been accumulated in the utilization of heat from nuclear sources. The Bilibino ATETS has beenoperating for a long time in Chukotka, the Shevchenko AES is desalinating sea water, and the heat from the Beloyarsk, Leningrad, Kursk, and Chernobyl AESES is being utilized. Two pilots AST's are now under construction: one near Gorkiy and the second near Voronezh. A decision has been taken on the construction of the first major ATETSES.

There is yet another promising sphere for the application of nuclear installations. Much organic fuel is consumed directly by industry--metallurgy, the chemical industry, and other sectors--where technological processes occur at high temperatures. The cut-back on fuel expenditure for these purposes which will be heated to about 1,000 degrees. [sentence as printed]

Thus, nuclear power engineering makes it possible in principle to supply power to practically all consumers of organic fuels.

Question: We have spoken about the new spheres of application of nuclear power engineering. And now a question for you, Aleksandr Sergeyevich. Tell us about the latest nuclear reactors on which the development prospects of power engineering depend.

Answer: The time has come, Doctor of Technical Sciences A.S. Kochenov says, when it is no longer appropriate to use just the nuclear reactors which were built initially and used uranium-235 as "fuel." This would lead to the situation where, in a few decades' time, cheap uranium would have been used up and the nuclear power industry would become economically inefficient.

What is needed are fast neutron reactors using plutonium as fuel. The process they use is such that the quantity of plutonium does not diminish with the passage of time, but increases: the plutonium atom "combination" not only releases energy but also forms (from uranium-238) on average more than one plutonium atom. Such reactors are called breeders. By using them, the efficiency of uranium as fuel increases dozens of times over.

Question: Why is there no series construction of breeders?

Answer: There are three reasons for this. First of all, plutonium is not found in nature. It is an artificial element and it has to be created or, in our terminology, produced. Plutonium is produced by existing thermal neutron reactors.

Furthermore, breeders are considerably more expensive than thermal neutron reactors, hence the energy they produce is more expensive. As time goes by, however, breeders will become profitable as organic fuel and uranium become more expensive (as a result of the exhaustion of cheap deposits).

And the last reason: it is necessary to establish a new industrial sector for the utilization of breeders. It would have to process the fuel irradiated in the reactors, separate the plutonium from it, and produce heat-generating elements for the reactors. The establishment of an industry for the processing of irradiated fuel also requires the solution of the problem of the safe burial of highly radioactive waste.

So far, not a single country has set up such a sector. But the accumulated experience gives grounds to suppose that the problems linked with its establishment can be solved. The most powerful breeders in the world have been built in the Soviet Union. One of them--the BN-350 (350-megawatt capacity)--(600-megawatt capacity)--at the Beloyarsk AES.

There are two stages in the development of the nuclear power industry. The first involves the construction of thermal neutron reactors (of the type presently operating at AESES). They are of a simpler design, produce cheaper energy, and produce plutonium for the breeders. As uranium becomes more expensive, the introduction of breeders will begin. They will have to produce plutonium not only for loading into new breeders, but also for the thermal reactors.

As more and more breeders come into operation, the need for natural uranium (for thermal reactors) will diminish. At some point in time breeders will constitute the basis of the nuclear power industry and this will mark the start of the second stage of its development. Nevertheless, the breeders will not oust thermal reactors entirely. The former will produce electric power and irradiate nuclear fuel, while the latter will use it economically.

Question: Valeriy Alekseyevich, it has already been said that the thermal neutron reactors could exhaust the nuclear fuel deposits in a few decades. How does the combined utilization of conventional reactors and breeder reactors change the outlook?

Answer: In principle, it is possible to envisage a situation in which the breeders will produce sufficient plutonium to guarantee completely the fuel supplies for both types of reactors which are either operational or under construction.

But the nuclear power industry can manage even without a regime of total self-reliance as regards fuel. The only thing that is important is to ensure that the demand for natural uranium is economically acceptable. With the use of breeders the energy content of natural uranium will become so high that even the poorer uranium ores will become profitable. The uranium reserves in the form of ores of that kind are so great that they would be sufficient for many hundreds of years.

Work is now in progress on the designing of breeder reactors which would produce fuel at sufficiently high speeds. New thermal neutron reactors are also being developed that are economical in their consumption of nuclear fuel. Furthermore, constantly growing attention is being paid to ensuring the safety of nuclear power installations.

In the long term, the nuclear sources can provide the basis for a number of fundamentally new technological processes, making flexible use of all types of energy sources: heat, electric power, and hydrogen (or its compounds with other elements) to produce different products and improve operations. Of course, such flexible energy technology must be harmonically integrated with the environment.

At the conclusion of our talk, said academician V.A. Legasov, I would like to sum matters up briefly. Nuclear power engineering makes it possible to assure mankind's energy requirements for many hundreds of years. The basic problems in this sphere involve, in the first place, the development of nuclear power engineering installations for new fields of application, and secondly, the construction of breeders with a higher plutonium production capacity, thermal reactors which make better use of fuel, and an industry for the processing of irradiated fuel.

CSO: 1822/346

NON-NUCLEAR POWER

CURRENT STATUS, COMING IMPROVEMENTS OF COUNTRY'S POWER GRID TOLD

Moscow EKONOMICHESKAYA GAZETA in Russian No 29, Jul 83 p 2

[Article by the Power-Engineering and Electrical-Equipment Section of USSR State Committee on Science and Technology: "The USSR Unified Electric-Power System"]

[Text] The creation of the USSR Unified Electric-Power System (YeEES) has been a continuation of the embodiment of the ideas that Vladimir Lenin set forth back in the GOELRO [State Commission for the Electrification of Russia] Plan. The papers of the 26th CPSU Congress paid special attention to further development of the USSR YeEES on the basis of progressive scientific and technical solutions and highly productive equipment.

The rated capacity of the USSR YeEES's power stations at the start of 1983 was 239 million kW, and the generation of electricity exceeded 90 percent of the All-Union capacity. The next 5-7 years should be the concluding step in forming the YeEES. It covers practically all the country's inhabited territory and concentrates 97-98 percent of all the electricity generated in the USSR. Increase in the capacity of electric-power stations and their units requires further acceleration of the development of superhigh-voltage grids as well as an increase in their throughput.

The specific-purpose integrated scientific and technical program, "Further Development of the USSR Unified Electric Power System (YeEES) with a View to Increasing Its Effectiveness and Operating Reliability and to Reducing Losses of Electricity in the Electrical Networks," which is being realized during the five-year plan, will serve to solve these problems.

Of Superhigh Voltage

The blossoming of nuclear power and the forming of the Ekibastuz and Kansk-Achinsk Fuel and Power-Engineering Complexes require, together with the construction of high-capacity electric-power stations, a radical change in the system of power-transmission lines. This refers to LEP's [power transmission lines] of 1,500 kV DC and 1,150 kV AC current. The scale of the power transmission (4,000-6,000 mW) that is required and the distances (2,000-4,000 km) involved do not enable these tasks to be solved at the existing technical level by using the LEP's that have been assimilated.

Erection of the long-distance Ekibastuz-Central Economic Region and Siberia-Kazakhstan (Ekibastuz)-Urals superhigh-voltage power lines (SVN's) called for by the program will enable distribution to the European part of the country and to the Urals of power from electric-power stations that run on the basis of cheap local coal. The possibility appears of using Siberia's hydroelectric-power stations to cover the variable portion of the load curve of the power systems of the country's European portion, where the share of nuclear-power stations is growing increasingly. The SVN's will enable petroleum-product consumed as fuel by electric-power stations to be cut and the annual volume of solid-fuel hauling by rail transport to be reduced by 400,000 cars.

The introduction of potentials of 1,150 and 1,500 kV is, economically, extremely effective. In comparison with the 500- and 750-kV AC and 800-kV DC voltage classes, which have been mastered in world practice, this will enable the consumption of rolled metal section and of steel-aluminum wire to be reduced 1.5-fold to 2-fold and capital investment to be cut 1.2-fold to 1.6-fold. Calculations indicate that laying the 1,500-kV DC Ekibastuz-Central Economic Region electric-power line, with a throughput of 6,000 mW and a length of 2,400 km, will be more suitable than construction of a nuclear power station of 6,500 mW capacity in the country's center. The gain is 106 million rubles per year. Electric-power transmission lines of 1,150 kV AC have a throughput of 5,500 mW, replacing five LEP's of 500 kW each--the highest voltage of the grids that now form the system in the country's Asiatic portion.

The program contemplates introduction during the 11th Five-Year Plan of the world's first industrial LEP-1150 [1,150 kV power transmission line], the 900-km long Ekibastuz-Kustanay line, as a component part of the Ekibastuz-Urals line, and the construction of a number of other LEP's of this class.

The creation and production of sets of highly effective electrical equipment for them, including reduced levels of insulation, have been defined as a separate task.

The reduction in insulation levels is most telling on the transformer equipment, which is most expensive, and on the rise in technical and economic indicators. Each percent of reduction of the test voltage leads to a 0.4-0.7 percent cut in total transformer weight, a 0.2-0.3 percent reduction in total costs, and a 0.6-0.8 increase in the maximum capacity of the transportable units.

Scientific-research work on further raising power-line voltages is being performed as a backlog of completed work for the long term.

As experience has indicated, in order to provide for reliable and stable operation, controllable electrical interconnections between various parts of the YeEES must be created. The program dictates the establishment of such interconnections between the North Caucasus and the Transcaucasus, using a 200-mW asynchronized electromechanical frequency converter, and introduction of the world's highest-capacity DC-current electric-power converter substation (an insert), based on 1,000 mW, between the USSR YeEES and the power system of our northern neighbor--Finland--is planned. Simultaneously, other

methods and means for increasing reliability, including regime control by computers, are being developed.

A number of tasks have been aimed at mastering the production of insulating structure made of polymer materials for 110-750 kV power transmission lines and of progressive types of electrical equipment and apparatus with improved technical and economic indicators. The use of polymer insulating structure is a new and effective way of raising the operating reliability and throughput of 110-750 kV LEP's. Their use will enable a great reduction in materials intensiveness, a cut in time spent erecting power lines, especially in regions difficult of access, and the conversion of existing lines to higher-voltage categories.

A big problem with the existing level of equipment are the losses, still high, in the grids. They reach 9.2 percent of the energy delivered to the grid. This situation is explained by an inadequate degree of compensation for reactive power--about 0.2 kVA per kilowatt of rated capacity.

The program calls for sharp improvement of this indicator by introducing automatically controlled compensating installations, mainly banks of static capacitors with new equipment that will enable power losses to be reduced by about 8.5 billion kWh in the next few years.

The long-term total economic benefit from developing and introducing new equipment and technology under the program will be hundreds of millions of rubles.

In the Role of Pioneers.

Our scientists are taking on the role of pioneers in the realization of many of the program's tasks. Problems that have no counterparts in world experience are being solved.

Electric-power lines of 1,150 kV are being created for the first time in the world by using unique technical solutions. Minelektrotekhprom [Ministry of Electrical Equipment Industry] enterprises have already completed development of a set of basic equipment for the first LEP of this voltage class and have turned it over to an interagency commission (the prime organization is VEI [All-Union Electrical Equipment Institute] imeni V. I. Lenin). New equipment is being delivered to the power-transmission lines that are being built, primarily the first phase of the Ekibastuz-Kustanay LEP.

The LEP itself is being constructed at a rapid pace, although its erection under the severe conditions of the Kazakhstan Steppe is not a simple matter. Suffice it to say that this will require the installation every 400 meters of supports that are 40 meters high and 48 meters wide in the upper section, with later suspension from them of three phases, each of which consists of 8 steel-aluminum conductors 3 cm in diameter that are located at the corners of a regular octagon with sides of 40 cm. In 1982 USSR Minenergo [Ministry of Power and Electrification] construction and installing organizations completed construction of the first 500-km, Ekibastuz-Kokchetav, segment, and this year it will complete construction of the second, 400-km long, Kokchetav-Kustanay segment.

Minelektrotekhprom and USSR Minenergo enterprises have done much of the scientific research, experimental design and testing. Many basically new solutions have been incorporated in the design. Thus, the scheme for interconnections of the autotransformer windings was improved, progressive insulation was introduced, an original modular-construction scheme was used for the lightning arrestor, and consolidated 250-kV modules were developed for the circuit breakers.

The development of modernized sets of electrical equipment for 1,500-kV DC power-transmission lines has also been basically completed. Two units of the USSR-Finland DC converter substation (an insert) have been introduced.

Glavtsentrelektroset'stroy [Main Administration for the Construction of Electric-Power Grids in the Central Economic Region], Energoset'proyekt [All-Union State Design, Survey and Scientific-Research Institute for Power-Engineering Systems and Electric-Power Networks], VNIIE [All-Union Scientific-Research Institute for Electric-Power Engineering] and the VPO Soyuzelektroset'izolyatsiya [All-Union Association for the Production of Insulation for Electric-Power Networks] carried out the task of introducing an LEP-750 of increased throughput with an increased splitting radius a year ahead of time.

In 1982 the 303-km Chernobylskaya AES-Vinnitsa line, with five conductors in a phase, was accepted for operation. In this case, the distance between the phases was reduced and the step interval of splitting of the conductors was increased. The cross-section of each conductor has been increased from 240 to 400 mm^2. As a result, aside from the increase in throughput, an appreciable reduction in the loss of electricity is provided for. USSR Minenergo is building still another series of 750-kV lines with a total length of 1,700 km in accordance with the engineering solutions adopted for this line.

Ten types of polymer insulation designs for 110-750 kV LEP's were developed ahead of schedule, and an initial production lot of polymer insulators and crossarms for 110-330 kV were manufactured. The serial output of low oil content circuit breakers for 110 kV and of nonlinear overvoltage limiters for 750 kV has started.

Scientific research has been done on new types of overhead lines for electric-power transmission of increased throughput and controllable electrical interconnections, using asynchronized electromechanical frequency converters, which have enabled the design of specific facilities to be started with the use of these technical solutions. A number of papers on standards and procedures to insure voltage quality and to reduce power losses in the grids have been prepared. Minpribor [Ministry of Instrument Making, Automation Equipment and Control Systems] has started to produce an information-measuring system for determining readings of the quality of the electricity in integrated fashion.

The Need to Catch Up.

Unfortunately, not all the tasks of this important program are being fulfilled successfully. The construction of 1,150-kV substations by Glavvostokenergostroy [Main Administration for the Construction of Electric-Power Systems in

the Eastern Economic Region] (the chief is G. Aksenov) is going on at an unsatisfactory pace, lagging behind laying of the LEP. Because of this, the equipment that has been delivered cannot be installed yet. Proper storage for equipment has not been provided at the Ekibastuzskaya and Kokchetavskaya Substations. As a result, some of the equipment needs repair.

The VPO Soyuztransformator [All-Union Association for the Production of Transformers] (the chief is O. Gavrilov) still has not delivered the VNV-1150 circuit breakers and VO-1150 on-off switches that are needed for startup in 1983.

Minelektrotekhprom (the deputy minister is V. Subachev) still has not decided about the manufacture of synchronous compensators for insuring the designed value of the power being transmitted over 1,150-kV lines. Leningrad's Elektroapparat Association (the director is I. Porokhnya) of this same ministry is delaying the dates for fulfilling tasks of creating progressive types of electrical equipment: sulfur hexafluoride switches and outfitted sulfur hexafluoride installations.

USSR Minenergo's technical services are reacting slowly to questions related to the development and introduction of new types of electrical equipment. Glavniiproyekt [Main Administration of Scientific-Research and Design Organizations] (the chief is L. Voronin) and Glavtekhupravleniye [Main Engineering Administration for Power Systems Operation] (the chief is V. Gorin) have delayed adoption of a decision on the need to develop and introduce sulfur hexafluoride and vacuum circuit breakers in power engineering. Despite repeated instructions of USSR Minenergo, they have never agreed on the technical papers for capacitors and banks of shunting and filtering capacitors for 1,500-kV DC LEP's.

USSR Minenergo organizations are expanding Minelektrotekhprom plants for the purpose of increasing the output of electrical equipment but at an inadequate pace. This refers to the erection of the research and test building of Moscow's Elektrozavod Association by Mosenergostroy [Moscow Trust for Power-Engineering Construction] forces (the manager is Ye. Matveyev) and the superpowerful-transformer department of the Zaporozhye Transformer Plant by Dneprostroy [State Dnepr Construction Administration] (the chief is B. Kuz'menko) and to expansion of the Velikoluks High-Voltage Equipment Plant.

The situation in regard to electric-power losses in the grids provokes serious anxiety. The share of losses has not been reduced at all in 2 years of the five-year plan. The cause of this is primarily inadequate delivery of capacitors by Minelektrotekhprom. Minkhimprom [Ministry of Chemical Industry] (the deputy minister is Ye. Vlaskin) has been slow to manufacture polypropylene capacitor film, the use of which enables the unit capacity of capacitors to be raised 1.3-fold to 2.6-fold, with no change in size, depending upon the voltage class.

All participants in the program must employ the time remaining before the end of the five-year plan to eliminate the obstacles in the way of introducing the new, highly productive equipment and technology that have been noted.

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PIPELINE CONSTRUCTION

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OUTFITTED-MODULE CONSTRUCTION AT OIL, GAS FIELDS SHOULD BE EXPANDED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 83 pp 2-7

[Article by Yu. P. Batalin, chairman of the Coordinating Council on Outfitted-Module Construction: "The Development of Outfitted-Module Construction of Oil and Gas Facilities"]

[Text] The outfitted-module method of construction has reached that level at which one can talk about creating a special production complex that is distinguished by special equipment, technology, organization and cooperative links and by economic and juridical relationships. Actually, this is a new specific subbranch of the economy.

The CPSU Central Committee decree, "On the Work of the Ministry of Construction of Petroleum and Gas Industry Enterprises on Technical Reequipping and the Introduction of Progressive Methods for Construction Operations," noted Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] achievements in introducing the outfitted-module method. However, it also pointed out that its application had not been completely developed. The CPSU Central Committee required the ministry to insure further improvement of the outfitted-module construction method (KBMS).

In developing a strategy for developing this method over the long term, one must proceed from the instructions of CPSU Central Committee General Secretary Comrade Yu. V. Andropov that were expressed at the November 1982 CPSU Central Committee Plenum: the main thing is to accelerate the work of improving the whole sphere of supervision of the economy--management, planning and the economic mechanism. Those conditions--economic and organizational--must be created that will stimulate high-quality productive labor, initiative and enterprisingness.

Minneftegazstroy is developing the outfitted-module method during the 11th Five-Year Plan in accordance with an Interagency Specific-Purpose Program. In order to define the strategy of future development, the results must be summed up and an evaluation made of what has been done.

The ministry, cognizant of the experience of Sibkomplektmontazh [Association for the Outfitting and Installation of Constructional Structure in Siberia], created within general-contracting main administrations eight mobile trusts

that are based in areas of concentrated construction of oil and gas facilities. The general-contracting trusts are specialized in building up the engineering facilities of construction site, and in performing the below-grade operations. In this way, a number of regional and industry type production systems for outfitted-module construction are being formed.

The capacity of Soyuzneftegazstroykonstruktsiya [All-Union Association for Constructional Structure for the Erection of Oil and Gas Enterprises] and enterprises for manufacturing constructional members and semifinished articles for modular installations are being developed simultaneously. VNIIST [All-Union Scientific-Research Institute for Trunk Pipeline Construction], SibNIPIgazstroy [Siberian Scientific-Research and Design Institute for the Gas Industry], the EKB [Experimental Design Bureau] for Reinforced Concrete, the SPKB [Special Design-Development Bureau] of Proyektneftegazspetsmontazh [Institute for the Development of Oil and Gas Industry Facilities That Require Special Construction and Installing Work] and NIPIorgneftegazstroy [Scientific-Research and Design Institute for the Introduction of Advanced Operating and Work Methods for Oil and Gas Industry Construction] have created subunits that are doing scientific, technical and design-development work in the area of outfitted-module construction.

Consolidation and improvement of the scientific and the production bases for outfitted-module construction has made it possible to cope with the main tasks of the integrated program. The output of BIV and TsTB type box modules has been mastered. The production of progressive panels made of shaped planking with PSF-VNIIST insulation is being organized.

A large number of technical and organizational solutions for the below-grade cycle of operations is being introduced. The most important solutions are: conversion to industrialized type pile footings both for buildings and structures and for pump and compressor units; the transfer of underground utility grids to surface supports; the organizational and operational separation of below-grade cycle work from the erection of the surface portion of jobs; execution ahead of time (in relation to the surface portion) of below-grade cycle operations; and the installation in the main departments of gas and oil pump stations of rough floors prior to erecting pile footings for the framework and the main units.

Unified design solutions for compressor stations with various types of units have been developed and are being mastered. The introduction of progressive three-dimensional layout solutions for UKPG's [integrated gas-treatment installations] has started at Urengoy.

In the last 2½ years, production capacity 440,000 m² in area--about 200,000 m² of it made from collapsible sections--has been constructed from box modules. The construction of housing complexes made of box modules produced by the Oktyabr' plant is being developed. Since the start of the five-year plan, 196,000 m² of useful area have been built from such premises. The production of housing complexes for permanent residence from box modules from the Vinizili combine in Tyumen Oblast has been organized. In 1983, about 100,000 m² of living space will be built out of these modules. The output of housing complexes in metal cylindrical modules (TsUB's) is being expanded. The output

thereof in 1983 will exceed 1,600 units. The production of health-services complexes in a modular version (Tonus) will reach 250 units this year. The manufacture of easily assembled sports complexes with swimming pools has been organized.

Designs have been created and the output has been organized of a parametric series of modular facilities for engineering services for Pioneer bases and for permanent settlements and towns. Among them are boilerhouses with DKVR and DYe type boilers, transformer substations, water-system pump stations, installations for preparing water and structures for purifying sewage. The highest-capacity modular purification structures, with a productivity of 15,000 m^2/day, have been built in the cities of Urengoy and Noyabr'sk.

Since the start of the five-year plan, facilities costing 1.5 billion rubles have been constructed with use of the outfitted-module method.

An expansion of the volume and technical improvement of the members of integrated-module construction bring a reduction of the time spent erecting the main facilities. Thus, compressor stations of the Urengoy-Gryazovets gas pipeline were erected in an average of 19 months versus the norm of 21 months, the Urengoy-Petrovsk pipeline in 17 months, and the Urengoy-Novopskov pipeline in 15 months. Oilfield facilities are being erected, as a rule, rhythmically, with a substantial reduction in the standard construction time.

Other specific results that were produced during this period were: an estimated reduction of about 7 percent in live-labor expenditure at construction sites and a 4-5 percent reduction in budget-estimated costs. These indicators are below the goals specified by the integrated program, despite the fact that the main measures within the industry were carried out. The chief reason for this is unsatisfactory solution of questions at the inter-industry level.

Inadequate attention of interdependent industries to the outfitted-module method has led to a delay in introducing a number of developments and solutions. Thus, the introduction of unified design solutions for compressor stations that will permit the cost per unit of capacity to be reduced by 15 percent and labor expenditure by 30-40 percent, which were developed by the SPKB of Proyektneftegazspetsmontazh, was held back for practically 3 years. In order to realize SibNIPIgazstroy developments in raising the industrialization level of UKPG designs at Urengoy, which will enable labor expenditures at the sites to be reduced by 26 percent and costs to be cut by 10 percent, required 4 years. Hindrances in the application of progressive solutions has led to an increase in construction time and the involvement of several thousand additional workers in the northern regions.

The outfitting of facilities with equipment continues to deteriorate. Because of shortfalls in equipment deliveries, unoutfitted box modules have been sent to construction projects. Thus Sibkomplektmontazh alone manufactured in 1975, 1976, 1977, 1978, 1979, 1980, 1981 and 1982, respectively, 871, 1,008, 1,593. 1,618, 2,219, 1,956, 2,313 and 2,743 box modules. Of these, the numbers of box modules sent to construction sites completely or partially equipped were, respectively, 407, 419, 715, 553, 754, 498, 583 and 656 units.

Sending underequipped modules to a construction job is no way out of the situation. It only complicates matters, since installing the equipment in the cramped quarters of the construction site is very complicated and expensive in comparison with installation at the plant,on the box module's open foundations in a strict manufacturing sequence. The effect of the modular method is wasted to a significant extent because of this.

The clients bear practically no kind of responsibility for timely equipment outfitting. The conversion of construction organizations to evaluation of their activity by construction commodity output is not combined with measures for raising the client's responsibility for outfitting and for timely solution of other problems. On the contrary, the conversion of construction organizations to the credit-granting form of financing the costs of construction work has led to the clients participation in capital construction becoming worse. Such a previously existing economic lever as the obligation to provide uninterrupted financing for the construction project, which induced the client to solve problems of design, outfitting and so on in good time, has disappeared.

At the same time, with conversion to evaluation of construction organization activity by commodity output, the requirements for work quality and for the integration of construction work have risen, and the introduction of facilities with work uncompleted is prohibited. This, it goes without saying, is correct. However, extensive restructuring of the system for planning and evaluating construction organization activity and the acceptance of completed facilities for operation should, of course, be accompanied by measures that will provide for timely and effective execution of such important components of the investment process as design, outfitting and setting-up work.

An evaluation of the modern level of development of the outfitted-module construction method will enable rational ways for improving investment processes to be determined on a scientific basis.

Originally, the method was viewed as an amalgamation just of technical solutions of narrow parochial importance. Now, however, it has become increasingly obvious that this is a new step in the industrialization of construction, which differs from its predecessor in that not only has a portion of the construction work been transferred to plants for the manufacture of prefabricated constructional structure but so has a substantial portion of the installing work and the processes of outfitting and control.

The outfitted-module method is a system of technical, organizational and economic solutions that are aimed at increasing capital-construction effectiveness: reducing the time required to erect facilities; cutting the cost per unit of capacity; and lessening total labor expenditures, especially of live labor, at construction sites.

The scientific basis of the method is the purposeful amalgamation of operating processes, organizational structures and control functions. These principles reflect overall trends in production development in the modern era. Their essence lies in each production collective (be it a brigade or main administration) being oriented not to the performance of individual

processes but to achievement of the overall result. In construction, this is the introduction of planned capacity and facilities into operation at minimal cost in supply, equipment and labor resources.

Thus, with the outfitted-module method of construction, the purposeful amalgamation of operating processes is realized by executing the following measures:

The transformation of industrial facilities into facility sets of transportable modules and structure, which include:

transportable three-dimensional construction-operations modules, with the basic and auxiliary operating equipment, power and sanitary-engineering equipment, and other equipment and the support systems erected at the factory; sets of industrialized structure for easily assembled roof coverings for the facilities, which, because of transport restrictions, cannot be transformed into a set of transportable modules; sets of structure for industrially produced foundations, footings and supports for the surface utility grid; and sets of structure for utility grids and service lines.

The creation of highly productive operating processes for forming facility sets of modules and structure, and the concentration thereof at special prefabricating and outfitting enterprises (or plants), situated at places more desirable from the point of view of social and economic factors;

The creation and execution of highly productive operating processes for transporting facility sets of modules and structure to construction sites; and

The development and introduction of specialized resources and operating methods for installing facilities made of modules and industrially produced structure.

The purposeful amalgamation of organizational structures and management functions has been realized by taking a number of steps:

The creation of industrialized-construction entities (associations or trusts) for outfitted-module erection of the above-ground portion of facilities. These entities, which are of a new type, are created to be a kind of joining of two industries--machinebuilding and construction, taking into account their specific characteristics--which will enable the mobility and pace of construction work to be raised greatly. Subunits have been joined that are specialized by phase of the construction "assembly line," operate on a single set of construction books, and are oriented by the whole system of planning and economic indicators toward the final purpose--the introduction into operation of the facilities under construction;

The gradual transformation of general-contracting general-construction trusts and regional-type trusts that are specialized in the engineering preparation of construction sites and the below-grade cycle of operations;

The organization of primary production collectives in the form of consolidated cost-accounting brigades, or final product sections, that can autonomously implement the expeditionary rotating-duty method of building industrial

and nonindustrial complexes that are made up from facility sets of modules and structure, in regions that are several thousand kilometers away from the assembling and outfitting enterprises;

The forming of production systems, organized by industry or region and industry, for erecting facilities by the outfitted-module method, within the framework of which subunits for scientific and technical preparation, design and design-development, the manufacture of modular installations and constructional structure, and the erection of facilities are coordinated; and

The establishment of a cost-accounting mechanism that will support the whole aggregate of administrative and managerial actions, economic levers and stimuli for concentrating the forces of the collectives that make up the production systems and for achieving specific final results.

If a tree of missions is constructed for an oufitted-module construction subbranch that is formed on the basis of the above-indicated principles of purposeful amalgamation, then its root will be the industry's mission and the branches will be the missions of the primary production collectives.

Taking into account the scientific and methodics bases of the outfitted-module construction method that have been established, let us examine certain most important intraindustry measures for its further development and improvement.

Much benefit can be obtained by improving the organization and incentives for the primary production collectives. The broad-scale experiment of creating consolidated integrated brigades that work under contract under a foreman or superintendent, who also functions as the brigade leader, which is being conducted within Sibkomplektmontazh and other subunits, has indicated high effectiveness for this method.

The contracting form of organization and wages helps the purposeful consolidation of collectives, intensification of production, and more complete use of the internal potential of collectives. The experience of the leading brigades of Comrades Buyanov and Kil'dyushov, of Sibkomplektmontazh, indicates that it is precisely this path that will best enable people to be indoctrinated in a feeling of collectivism and a thrifty attitude toward socialist property and enable them to develop forms of self-control, stimulate creative and labor energy, and strengthen production and technological discipline in the best way. The inclusion of engineers and technicians in the brigades will enable the brigades' independence to be increased and engineering operations preparation for production work to be improved. Engineers and technicians in these cases are operating with great energy and effect, and psychological tension in the mutual relations between blue-collar workers and engineers and technicians is disappearing.

The laboring collective, which is aimed at attaining a specific result that the state needs, possesses enormous strength. It is here that the actual conditions are creating for realizing the "not-so-simple job," quoting Yu. V. Andropov, of transforming "my," which is based upon private ownership, to the more social "our."

Practice indicates that small brigades that perform individual processes (for instance, sanitary-engineering or electrical-installing work) do not possess this strength. Members of these brigades, who wait for hours for "shop hands" to drill holes for them, to make scaffolding or to take trash away, are not inculcated with an intelligent attitude toward specific state interests and respect for the labor of comrades who are performing interdependent operations.

Since the very start of Sibkomplektmontazh's experiment, the task was posed of gradually consolidating the primary production collectives and of shaping their composition in manning and the trades in such a way that they would be able to accomplish the final mission--to erect and introduce certain facilities into operation.

But success was attained only at small facilities. When erecting such large complexes as KS's [compressor stations] and UKPG's, where a large number of workers take part in construction, the contract principle of organizing wages still have not been implemented, but, thanks to the initiative of the workers' themselves, this principle was successfully realized in large production collectives during the construction of nonindustrial facilities. Thus, Comrade Smirnov's brigade from Sibkomplektmontazh, which consists of 140 persons, is working under full contract and is successfully erecting housing and cultural and domestic-services facilities. This brigade is working without job orders, and the wage fund is determined according to the facilities that are presented. It is computed in percents of the budget-estimated cost of the construction and installing work for the facilities that are to be put into operation. Wages are advanced during construction, and the final settlement, including bonus awards and piecework increments, are made after the facilities are turned over by the state acceptance commission.

Such a method fully guides the collective toward the final result, completely excludes inflated reports, eliminates every kind of nonproductive labor expenditure, provides it with a rational strenuousness, and practically excludes violations of labor and production discipline.

In 1982 Smirnov's brigade, using its own forces, did 3.260 million rubles' worth of construction and installing work and put into operation facilities with a total cost of 4,253,000 rubles, including 3.510 million rubles' worth that was done with its own forces. In practice, this is a construction section, in whose organization and pay the brigade cost-accounting and contract forms were used.

There is every reason to draw the conclusion that broader development of contracting principles for organization and pay in both brigades and in larger organizational structures is desirable.

Especially great benefit can be obtained in industrial operations with the development of the brigade form for organizing work and pay. In some cases it should be spread to individual industrial-production facilities, technological lines and small departments. In some trusts it is desirable to use the contract form of organization and wages as a whole for enterprises that do prefabricating and outfitting work.

Propagation of the contract method for organization and pay at large industrial production collectives, to include not only piece-rate workers but also temporary workers and administrative and managerial personnel, in combination with introduction of the principles for fulfilling and overfulfilling production tasks with fewer workers, using a portion of saved wage funds as incentives for the collective's workers, will enable production effectiveness and, above, all, labor productivity, to be raised.

There is a persistent necessity to propagate the contract method of organization and wages also to collectives that are transporting the modules and other structure to the construction sites.

With a view to accelerating the transfer of operations from construction sites to factories, Sibkomplektmontazh and the mobile trusts should be charged with the responsibility for carrying out the whole set of operations on erection of the above-ground portion of the facilities. In order to carry out the special operations in this case, special organizations should be enlisted under subsubcontract, and, later, technological lines should be created at the factories to perform the special work that cannot be avoided by improving the design solutions.

It is planned to introduce the status of chief installing organization for SKM [Sibkomplektmontazh] and the mobile trusts. The chief installing organization, jointly with the general contractor, will conclude an agreement with the client for construction of the appropriate facilities.

It is proposed to introduce two restrictions that will not allow work to start on construction of the above-ground portion of the facilities prior to final completion of the engineering buildup of the site, the below-grade cycle operations, and full completion of the outfitting of the facility within the complex that is due for early startup. The first of the restrictions is the certificate of acceptance of the below-grade work, and the second is the certification of acceptance of sets of articles and structure that are signed for by the contracting cost-accounting installing brigade (or section).

Before construction of the industrial complex is started, a well-prepared site for building up the modular devices and for conducting consolidated assembly of the pipe components and stock should be established.

A number of additional steps must also be taken to stimulate the association's subunits and the mobile trusts that are specialized by stage (or phase) of the production process with a view to accelerating the whole process--from the manufacture of sets of structure to introduction of the facility into operation.

At present these subunits are given incentives to introduce the facility into operation. This sometimes occurs 5-6 months after the corresponding subunits have completed their work, because of which the stimulating function of the incentive is reduced somewhat.

Apparently it will be more desirable to pay a partial advance bonus for introducing facilities into operation as various phases of the production work

are completed. Thus, the cost-accounting interests of the subunits that specialize by stage of production will be set up as a function of two factors: the turnover to inderdependent workers of a facility set of modules and structure, and the introduction of facilities into operation.

The use of industrialized work methods requires high mobility of production collectives. Special attention must be paid, therefore, to further improvement of rotating-duty and expeditionary rotating-duty systems for organizing the work. At the end of 1982, experience gained in the industry was generalized, a statute was worked out and approved, and recommendations were made for further development of this system for organizing labor. There are many problems here.

On the agenda are problems of compatibility, determination of the psychological factors that respond best to the rotating-duty work regime, and many other socio-psychological problems. All these questions require a scientific approach, diverse experiments and analysis.

A most important prerequisite for forming large primary production complexes is the stability and rhythmicity of their workload over a long period, since only in so doing can conditions be provided for stability of the collective and its disruption prevented.

That is why, in order to realize the purposeful amalgamation of organizational structures and control functions, it is necessary to orient the whole system of planning, reporting and stimulation to the primary production collective that is doing the work to fulfill a definite phase of the production assembly line.

The greatest effect from realizing the principles of purposeful aggregating of the operating processes can be provided through the introduction of large-dimension modules of great weight (supermodules).

The industry already has much experience in erecting facilities with supermodules. Cluster wells and booster pump stations and boilerhouses with DYe type boilers are being built at oilfield facilities, and SibNIGIgazstroy has created designs for gas-field facilities made up of supermodules. In order to develop this progressive method, such design developments must be introduced more boldly, and the creation of a production base for manufacturing the supermodules must be speeded up.

Modern supermodules are outfitted-module installations in completed form, which are moved to the place of installation by a water-and-land route. The modules are designed to consist of two main parts--a pontoon module and the upper, or deck, portion.

The design for a base close to Tyumen calls for manufacturing the pontoon module on the basis of the technology for building small ships, and, for erecting the deck portion--under a principle similar to the manufacture of box modules in the prefabrication department of Sibkomplektmontazh's BKU [outfitted-module installation] plant. With development of the technology of a base for supermodules, it is considered that the main plant for BKU's will have at

its disposal a high-capacity castings and forgings department, so prefabrication of the pontoons is to be accomplished with blanks and semifinished items delivered by this plant.

Following is the procedure for prefabricating the supermodules. Heavy and outsize equipment and components are first installed on footings, and then the framework and the remaining equipment and all the pipe connections are installed or assembled. After this, the enclosing structure is mounted, and, finally, the support system is finished.

The finished supermodules are delivered to a slip and lowered into a port parking basin.

In some cases, when the installed equipment weighs more than 50 tons, the supermodules are assembled completely at the building berths.

The desirability of realizing these principles for manufacturing supermodules requires verification in production. The most effective methods of prefabrication will be determined during production of them.

The main task today is to speed up construction of the base. It is necessary to introduce its first phase now, in 1983, and to complete it in 1984, so that in 1985-1986 an output of up to 100 supermodules per year will be provided for, since this is what the specific-purpose program calls for.

The increase in work volume in the northern regions, which are marked by higher snow and wind loads, require a choice of the most effective structure for buildings for industrial purposes. Most suitable for these conditions are arch-type buildings. They require less metal consumption per square meter of area than other designs. The labor intensiveness of their manufacture and prefabrication also is lower than that for other designs.

Design-development organizations must make a feasibility study of the possible spheres of use of arch-type buildings and define a rational parametric series. Obviously, spans of 6, 9, 12, 15, 18 and 21 meters will be expedient, enabling these buildings to be used at practically all oil and gas facilities.

Buildings made of collapsible sections (SKZ's) that are now being used widely must soon be taken out of production because of high metal consumption, unsatisfactory use of the load capability of railroad cars when they are being transported, and serious deformation during shipment.

Arch-type structure should be used instead of the SKZ's, while at some facilities RMM-type buildings with panels made of shaped planking, with PSF-VNIIST insulation, should be used.

As the outfitted-module construction method is developed within the industry, the requirement grows for industrial-building panels with progressive siding (shaped planking and aluminum) and insulation. However, the panels being produced are materials intensive, and buildings made from them do not meet the requirements of modern industrial esthetics.

In order to eliminate the deficiencies noted, in 1984-1985 the output of panels made of shaped planking with PSF-VNIIST insulation will be brought up to 600,000 m^2 per year in Tyumen, to 400,000 m^2 per year in Sineglazov and to 400,000 m^2 per year in Serpukhov.

A most important task is further development of outfitted-module construction of facilities in the nonproduction sphere. The industry has created for this purpose an industrial base for producing cylindrical TsUB modules fully readied at the factory and equipped with furniture, functional container-type modules completely readied at the factory of the VZhK and KMDO types, which are transformable functional modules of the BIV type with high factory-produced readiness.

The existing set of designs has enabled the development of a broad range of buildings for production, auxiliary, housing, social, sanitary and domestic-services purposes, including SERB's for KS's, dormitories and apartment-type housing, dining halls, domestic-services buildings for rotating-duty personnel, athletic complexes and a number of other buildings, and the introduction of such buildings based upon them.

In regions with high snow and wind loads, TsUB's are especially effective. They are suitable not only for settlements on the line but also for settlements for lengthy residence. In the latter case, as is the case with VShK's, it is desirable that they be configured for housing complexes that will enable dormitories (for 60-70 residents) with all the social and domestic services to be built.

Because the present use of VZhK modules of the Oktyabr'sk plant and KDMO's of the Vinzili plant require comparatively higher consumption of materials per square meter of useful space, it is necessary to convert to the creation of housing complexes in which three-dimensional modules are installed at a definite distance from each other and the space between them filled in with panels.

A most important prerequisite for further development of the purposeful amalgamation of operating processes is their mechanization at the prefabricating and outfitting enterprises, where manual labor predominates at present.

Experience gained in producing outfitted-module installations at enterprises differing in capacity indicates that it is desirable to manufacture elements with relatively stable parameters (footings, frameworks and panels) on mechanized and semiautomatic lines. Conversely, for elements with changing characteristics (operating equipment and engineering support systems) ganged flow-line technology with maximum employment of workplaces with power tools should be employed.

In order to increase series-type production of items for modules, their manufacture must be concentrated at Soyuzneftegazstroykonstruktsiya enterprises, and installation of the equipment for engineering-support systems and prefabrication of the box modules must be concentrated at prefabricating and outfitting enterprises.

The greatest benefit from introducing the outfitted-module construction method can be obtained in the realization of major national-economy tasks and by the integrated use of the method. In the near future the ministry will have to resolve the problems of an accelerated buildup of the Yamburg gas field. It is located in a region with much more complicated conditions than the oil-field regions of the Northern Maritime District and the Medvezhye and Urengoy gas-field regions.

All this field lies within the zone of soil that has been frozen for many years and has much more complicated characteristics than the soil at Urengoy. This region is not suited biologically for permanent habitation by people.

The industry has practically no time for doing preparatory work directly at the field.

Therefore, the task of an accelerated buildup of the Yamburg field can be solved only by means of the most effective technical, technological and organizational solutions of the integrated-module construction method.

It is desirable to formulate a special specific-purpose program for building up the Yamburg gas field. The Yamburg program should call for tasks for developing a base for supermodules; for designing all facilities in supermodule versions, and for accelerating the creation of special air-cushion transport for delivering supermodules that weigh 500-600 tons or more; for creating special corridors for delivering supermodules and other large-dimension structure; for the wide use of arch-design buildings for equipment-servicing bases, for materials and equipment supply, and for enterprises for shopping and for municipal and housing services; for forming housing complexes at UKPG's and at the docks, to be made from housing and domestic-services complexes that are formed from TsUB's; and for creating enterprises to produce progressive heat-insulating materials (such as vermiculite, pearlite, sotosilipor and so on) and highly mechanized lines to insulate pipeline with foam polyurethane, polystyrene, phenolic foam plastic, bituminous keramzit, and so on.

This same program should call for measures to improve organization, management and economic incentives and, primarily, to introduce the contract method of orgnizing work and wages in brigades and large production units. It is necessary to plan there a set of measures for choosing the most optimal regimes for the expeditionary rotating-duty type method of organizing work.

Analysis of the prospects for developing the outfitted-module method of construction indicates that the ministry has a sizable scientific and technical backlog of accomplished work that will enable the tasks of building up the Yamburg field to be coped with successfully.

As work on the realization of reserves within the industry for increasing outfitted-module construction effectiveness advances, numerous reserves that are not being used at the interindustry level will be increasingly appreciable.

A situation has prevailed wherein the builders, upon whom the system of economic and juridical levers places the basic responsibility for investment,

are not in a position to carry out their functions effectively, since they practically cannot influence such important components as design, outfitting and the inspection and setting up of equipment, which are rigidly associated operationally with other phases of the investment process. The time has come when subunits that are carrying out different phases of the investment process must be combined into integrated organizational structures--design and construction entities. This will be an organizational base for the conversion of construction to the turnkey method--the highest economic form of the investment process.

Then the construction ministries, based upon master schemes for developing various branches of the economy that have been worked out by the clients' branch institutes, will do the design work, realize funds for the purchase of equipment, outfit the construction project with equipment and with highly industrialized constructional structure, do the construction, installing, and startup and setting-up operations, and turn over to the client a completely finished facility that is in running order.

The costs for design, construction-and-installing, and prefabricating-and-outfitting organizations will be covered through Stroybank credits in the amount of the full budget-estimated cost of the facility being built. Settlements with the client will be made after turnover of the completed facilities.

Under turnkey construction, delays and lack of coordination occasioned by the late presentation of design and budget-estimating doucments will be precluded.

Violations of outfitting completeness and of deadlines for shipping equipment will be eliminated, and the synchronized concentration of resources will be insured at facilities due for early startup instead of the incomplete distribution of outfitting equipment among numerous facilities that are being built simultaneously, which the clients are doing.

Incentives for contracting organizations to cut construction time and to speed up the introduction of jobs into operation will be intensified, since the coordination of all stages of the investment cycle, beginning with design and ending with turnover of completed facilities to the client, will depend completely upon them (the contracting organizations).

Based upon the close contacts of construction and design organizations, it will become possible to perform, in good time, engineering and economic preparation for construction work and, when necessary, to combine the stages of working design and construction.

Transferring design organizations to the builders will be a most important measure for increasing construction operating effectiveness. The fact is that scientific and technical progress is achieved mainly through design. At present, construction organizations practically are not motivated to improve design solutions, since the benefit from introducing new solutions is not reflected in the results of their activity. On the contrary, frequently, because of the reduction in construction costs, many indicators are, in so doing, worsened (productivity, prime cost, yield on capital, and so on).

Client ministries object to the transfer of design functions to the builders, being motivated by the fact that the transfer will lead without fail to an increase in budget-estimated costs. In so doing, as an argument, they call attention to the inherent "contractor-salesman" striving to sell his product at a higher price.

Actually, the existing system for evaluating the activity of construction organizations in accordance with gross indicators makes the concepts "better" and "costlier" synonymous, since the whole system of moral and material incentives for the builders pushes them to increase the budget-estimated cost of construction. However, not always by far do the concepts "better" and "costlier" coincide.

Since the management mechanism, as the CPSU Central Committee and USSR Council of Ministers decree specifies, will be aimed at achieving the main purpose--turnover of the completed facility, the policy is being adopted of establishing fixed prices for facilities, and use of the outfitted-module method will enable prices for the above-ground portion of practically all oil and gas facilities to be developed and approved; then, when establishing that such prices will be in effect for a long time (apparently, the five-year period being planned would be most desirable of all), that same "contractor-salesman" nature will compel the builder to seek advantage primarily by reducing the cost of construction. Thus the "contractor-salesman" nature will, under these management circumstances, compel him, beginning with the design stage, and, thanks to the tool in the builders' hands--the design institutues--to seek out and use the potential for reducing construction costs by introducing the newest achievements of scientific and technical progress.

In opposing the transfer of design functions to builders, clients are also motivated by the danger that the fate of technical progress will fall into outsiders' hands. But yet technical progress depends decisively upon the active portion of the fixed capital--the tecnnical level of the operating equipment used. Meanwhile, new equipment is developed by the machinebuilding ministries, which manufactures the equipment.

The transfer of design organizations to the builders, the establishment of fixed prices for the various facilities, and the transfer to turnkey construction are radical means for raising capital-construction effectiveness. The outfitted-module method will receive powerful organizational and economic stimuli for its development.

Enormous possibilities for increasing the builders' creative activity are being opened up. Important economic grounds for creating more effective equipment for outfitted-module installations are being formulated.

Under turnkey construction and fixed prices for facilities, the economic benefit from introducing progressive design solutions and new equipment will enable the introduction of an effective system of incentives for design organization workers to develop economical designs and for the machinebuilders to develop more economical equipment. Of course, the introduction of new equipment and new design solutions should not reduce quality, reliability and

other customer qualities of the facilities, and, it goes without saying, these should be coordinated with the client.

Another most important feature for increasing construction effectiveness will be a change in the procedure for outfitting modular facilities. It is desirable that client ministries, with the participation of builders, defend equipment funds in USSR Gosplan and USSR Gossnab and that the contractors' prefabricating and outfitting enterprises assimilate the funds. The builders will, in this case, formalize a special credit with Stroybank to pay for the equipment.

Under this procedure, during formulation of the annual plan, there will be full clarity about the amount and the deadline for delivering equipment which will enable one of the most important requirements of the CPSU Central Committee and USSR Council of Ministers decree about the economic mechanism to be carried out, and plans for capital construction to be balanced with the supplying of materials and equipment. Then, violation of the completeness of outfitting and of deadlines for delivering equipment will be eliminated when deliveries are made, and there will be a synchronized concentration of resources at the facilities due for early startup.

There is reason to expect a large resonance effect from these measures. Enormous possibilities for increasing the builders' creative activity are being opened up.

It is just such a path that corresponds to the essence of the CPSU Central Committee and USSR Council of Ministers decree about improving the planning and intensifying the influence of the economic mechanism on raising production effectiveness and work quality and creates an economic and organizational basis for converting the construction branches to cost accounting, with a view to increasing construction operations effectiveness over the long term and realizing the principle of direct and complete responsibility of the construction branches for satisfying the national economy's requirements for the capacity of enterprises of definite branches of industry and for the correspondence of the level of construction operations with world standards.

11409
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CROSSING OF NADYM VIEWED AS DRESS REHEARSAL TO CROSS OB RIVER

Moscow IZVESTIYA in Russian 9 Feb 83 p 2

[Report by correspondent Yu. Perepletkin "Before the Storming of the Ob"]

[Text] THE GAS-EXPORTING PIPELINE, AS WE KNOW, IS NOW BEING LAID THROUGH A NEW "CORRIDOR" WHERE THE TAIGA HAD NOT UP TO NOW HEARD EITHER HUMAN VOICES OR THE ROAR OF MACHINES. RIVERS, TOO, HAVE TO BE TRAVERSED IN PLACES FAR REMOVED FROM FAMILIAR, TRIED AND TRUE CROSSINGS.

One of the first major obstacles on the northern leg of the pipeline are the deep waters of the Nadym.

"The entire crossing, including the mainstream, channels and floodlands of the Nadym, adds up to over 7 kilometers," says I. Doroshenko, technology department head of the trust "Severtruboprovodstroy". Our job is to traverse the low-lying, swampy sections of the floodlands. We have completed all clearing work and are now bringing in the pipes. The whole operation was severely hampered by a long stretch of warm weather."

Yes, the exceedingly mild winter forced these northerners to look for extraordinary solutions. For example, to prevent vehicles from sinking 3-4 kilometers of reliable road had to be built in a short period of time. But how? The usual methods were ruled out because of the limited time factor and the swampy, waterlogged terrain of the floodlands. What they did was use non-woven synthetic materials. Rolls of waterproof sheeting were unfurled all along the course and topped with soil. And lo and behold!--the new road was able to handle trucks, cranes, pipelayers, etc.

Those working here are truly the best of the best. The welders are all crack people from the installation team of USSR State Prize laureate B. Diduk. The crane operators, led by V. Semenchuk, are master craftsmen in their field. Pipe insulation and laying is in the hands of a team headed by V. Volkov. And not just insulation alone: the collective has assumed responsibility for ballasting as well, which is a novelty from the point of view of work organization. To secure the pipe and pin it down with ballast 2230 "reinforced concrete" pressdown weights will have to be installed along this comparatively short stretch. This is five times the usual number!

Negotiating the floodlands was no easy matter, but the principal action developed during the crossing of the Nadym. This crucial operation was entrusted to the highly experienced collective of construction administration No 7 for underwater work of the "Surgutpodvodtruboprovodstroy" trust.

All of a sudden the thermometer dropped to 25-27°C below zero. Clouds of steam rose into the cold winter air from the black, oil-like waters, the thick broken ice jangled and creaked. The tautly stretched cables throbbed like musical strings. The laying of the 1½-kilometer section across the mainstream had begun.

The section is firmly embedded on the river floor. Subdivision leader S. Stanevich waves a weary arm: well done, boys. The welders of V. Zubkov's and V. Kotelkin's teams lay aside their dark-glass shields.

A shore-to-shore strip of open water swallows up the body of the pipe and quiets down again. New ice begins to form imperceptibly on its surface. The crack will soon be completely healed, then blanketed with fresh snow.

"That's it, then?" I asked chief engineer of the trust V. Lavrinov. "An end to your worries?"

"Not at all," he replied. "Of course, the successful crossing of the Nadym could well be called a labor victory, especially if you consider that in the Tyumen sector of the Urengoy-Uzhgorod pipeline this was our "submariners'" first major operation. We still have to lay two small sections of pipe across the channels here, one 150, the other 130 meters long. You must not forget too that each and every water barrier must be traversed not only by the main strand, but a reverse one as well. And this oil-exporting pipeline will cross no less than ten rivers. Including the mighty, capricious Ob. So let's consider the crossing of the Nadym a dress rehearsal, as it were, for more complex and larger-scale projects."

These days on every stretch of the pipeline which runs for almost 1000 kilometers over Tyumen oblast the builders are hard at work. Their stated goal is to bring the oil-exporting conduit onstream very much before the deadline.

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URENGOY-POMARY-UZHGOROD GAS PIPELINE BEGINS CROSSING THE OB

Kiev PRAVDA UKRAINY in Russian 17 Feb 83 p 1

[Report by TASS correspondent V. Zhilyakov "The Storming of the Ob"]

[Text] Sergino, Tyumen oblast. 16 February. Today the workers of construction association "Soyuzpodvodtruboprovodstroy" began taking the Urengoy-Pomary-Uzhgorod gas pipeline across the Ob by laying a section on the river's floor. This river crossing is one of the most difficult of the entire line, its length is over 2.5 kilometers.

A rocket streaks through the pale winter sky. At this signal eleven pipe-laying machines lift the 400-meter long section with their jibs. A powerful winch on the opposite (left) bank of the Ob begins slowly dragging it to river. Soon the pipeline is under the ice.

"The builders have studied this region well," says V. Lavrinov, chief engineer of the Surgutpodvodtruboprovodstroy trust. "Not far from this site they've laid crossing for many gas pipelines which start at Urengoy or Medveziy. If the spring floods are heavy the Ob here inundates over 10 kilometers of ground. That's why we moved one of the best collectives we have--construction administration No 10--to these parts in the summer. Before winter came they brought in all the needed equipment, machinery, pipes, built the roads and laid the foundations of a field camp where the underwater men now reside."

It can now be said that the measure worked. Running two months ahead of schedule, the men have begun the final stage of the operation. They did, however, run into some surprises. The twenty-meter deep Ob had so flattened and polished the river floor that the standard machines were unable to dig a trench to house the pipe section. But the Siberians found a way. They fitted a dredger with a special cutter that loosened the unyielding ground of the bottom.

As the headpart submerges the welders are already preparing other sections. A test stand has been erected on the shore well equipped with modern gadgetry and mechanisms. It is here that the pipes are checked for operating pressure and each seam X-rayed. The quality of the welding is excellent.

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URENGOY-POMARY-UZHGOROD GAS PIPELINE CROSSES THE OB

Moscow IZVESTIYA in Russian 22 Feb 83 p 1

[Article by correspondent Yu. Perepletkin "The Great River is Subdued!"]

[Text] IT IS NOT FOR NOTHING THAT THIS UNIQUE OPERATION CALLED FOR SEVERAL MONTHS OF PREPARATION. THE CONSTRUCTION OF THE URENGOY-POMARY-UZHGOROD GAS-EXPORTING PIPELINE HAD REACHED THE STAGE WHERE THE NEXT STEP WAS THE CROSSING OF THE OB, ONE OF THE MIGHTIEST RIVERS ON THE FACE OF THE PLANET. AND THE LONG-AWAITED DAY FINALLY ARRIVED--THE STORMING OF THE WATER BARRIER HAS BEGUN! THE FIRST SURPRISE: A SUDDEN ONSLAUGHT OF BAD WEATHER SENDS HEAVY SNOWS SWIRLING AND SWAYING OVER THE OB!

Ye. Maksutov, chief engineer of special construction administration No 10 for underwaterwork, was gripping the fragile little box of a radio with his hand.

"Left bank! Left bank, do you read me? What is your load?"

It is over two kilometers to the left bank now shrouded in a white haze. The success of this underwater crossing depends on perfect coordination between the actions of each man and machine on both the river's banks.

"Everything will be just fine," said subdivision head V. Perminov. "It's Maksutov who's in charge of the operation, and he's got the magic touch. Speaking seriously, though, he's a bona fide, a thinking engineer with lots of experience. He'll weigh every last detail before beginning a job."

The job confronting the men from construction administration No lo of Surgutpodvodtruboprovodstroy is as serious as can be. Here on the right bank six sections have been readied, six huge cigars fashioned of large-diameter pipes. Each is 386 meters long. On the other side of the Ob is a powerful winch from which thick cables run under the ice all the way to the pipes. The entire section must be hauled across the river floor where a trench has already been prepared. The separate sections will gradually be welded one to another so that the overall length of the underwater conduit will add up to about 2.3 kilometers.

The crucial moment is at hand. The jobs of the pipelaying machines deployed along the first section are perfectly aligned. Standing motionless at the very head of the strand is diving team leader I. Artemenko with a little

pennant in his hand: he smiles faintly as he notices the big white letters on one of the pipes: "Ob, surrender!" Ye. Maksutov, controlling his excitement, puts his head down to the radio.

"Left unit, let's go!" And forthwith gives the prearranged signal to the tractor drivers.

The pipelayers simultaneously lift the giant cigar which is clad in an armor-like coat of pressdown weights (it weighs about 600 tons). Ten pairs of tracks begin their motion the same split second. The pipe creeps down to the steaming mainstream. The dark waters of the Ob draw nearer and nearer, at last the pipehead comes into contact with the surface. The cold waves lick the snow off the section in one quick sweep, down to the bottom slither the letters of the resolute inscription. The conquest of the Ob has begun.

Today the northern leg of the gas-exporting pipeline is depicted on a chart as a broken line, but the breaks are growing less and less in number. The crossing of the Ob closes one more gap on the map.

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CROSSING OF SOUTHERN BUG RIVER REPORTED

Kiev PRAVDA UKRAINY in Russian 8 Apr 83 p 1

[Item by correspondent M. Drozdov "Crossing the Southern Bug"]

[Text] The huge 440-meter long steel ribbon froze motionless before coming to rest on the river floor. These are tension-filled and at the same time solemn moments for all those engaged in the construction of the gas pipeline. The order is given--and the thousand-ton section which resembles a gigantic snake starts crawling toward the bed prepared for it earlier.

This is how subdividion No 5 of special construction administration No 6 for underwater operations from the construction association "Soyuzpodvodtruboprovodstroy" began the laying of a pipeline section across the Southern Bug in the vicinity of Tyvrov.

For every man on the gas pipeline, from subdivision head Aleksandr Nikolayev to the installation men of Yevgeni Deryuzhin's team, this operation was one of the most trying exams they had ever taken. The actual crossing was preceded by a lot of preparatory work. Here is what A. Nikolayev, the man in charge of all operations related to the crossing of the river, has to say about it:

"We had to take about 35 thousand cubic meters of soil and rock out of the water. Where the trench was to run and in the riverbed we encountered monolithic granite. Using explosives was ruled out--it would have caused grave harm to the local fauna. We used another method. A superpowerful excavator with reinforced teeth was shipped in from Leningrad, but even in the hands of such an experienced operator as Viktor Fedyashev it was able to deepen the trench a mere 10-15 cm a day. You can well imagine the effort that had to be put in to work the trench to its full depth of 2.5 meters.

Another reason why the trench on the left bank turned out so difficult was that it had to be dug across floodlands studded with granite boulders. Special attention was paid to checking the work already done. For everybody involved in the project the right to err just didn't exist. Everybody gave it all they had., every man proved himself a shock worker.

The Bug crossing was first slated for September, but was carried out in early April. Credit for this belongs to the entire collective, but special praise

must go to the team of installation men from special construction administration No 6 for underwater operations headed by Yevgeni Deryuzhin, Yaroslav Kopytko's team of welders from construction administration No 14 of the "Ukrtruboprovodstroy" trust, the divers led by their captain Yefim Kozlovets, welders Aleksandr Gorodok, Anatoli Ryabtsev, Stanislav Budarin and others."

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CEMA COOPERATION IN FUEL, ENERGY CONSERVATION REVIEWED

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 5, 1983 pp 38-42

[Article by Yevgeniy Gavrilov, CEMA secretariat: "Efficient and Economical Use of Fuel-Energy and Raw Material Resources"]

[Excerpts] Based on National Programs

The strictest conservation plan, efficient use of all types of resources, reduction in their losses and complete waste recovery are important links in production intensification and high final results with the least outlays of live and embodied labor. This was the focus of considerable attention in the decisions of the regular fraternal party congresses, the government decrees and the state plans for social and economic development of the CEMA member countries for 1981-1985.

The corresponding programs for national sectors and entire national economies up to 1985 and for the more distant future were aimed at their realization. These programs were developed on the basis of results from cooperation among the CEMA member countries in forecasting, as well as mutual consultations on the main questions of economic and scientific-technical policy. The exchange of leading experience on conservation and efficient use of all types of material resources played an important role here.

The national programs stipulate a set of interrelated organizational, technical and economic measures to guarantee efficient utilization of the main types of raw and processed materials, fuel and energy. Coordination of the resource-conserving policy and mutual cooperation of the CEMA member countries during the preparation of these programs were greatly instrumental in their similar structure. This is primarily an improvement in the fuel and energy balances, optimization of the sector industry structure, development of the material-technical base for decreasing energy and metal consumption, reduction in fuel and materials imports and their replacement by domestic resources. A lot of importance has been attached to more and complete recovery of minerals, an improved level of utilization of primary and converted energy resources, and the collection and recovery of secondary raw material. Interrelated measures for reducing losses, guaranteeing strict monitoring and calculation of the consumption of all types of material resources and building special apparatus are planned.

One of the focal trends for improving the fuel and energy balances is the accelerated development of nuclear power, decrease in consumption of oil and its replacement by lower quality energy carriers: domestic brown coals, lignites, fuel shales, etc. According to the directives for development of the economies of the CEMA member countries for the current 5-year plan, the percentage of AES's in electricity production will be 26 percent by 1985 in the People's Republic of Bulgaria, 12-14 in the GDR, and about 20 percent in the CSSR. Fulfillment of the AES construction program in the European CEMA member countries and the Republic of Cuba will conserve roughly 70 million T of conventional fuel per year.

It was noted at the 36th meeting of the CEMA session that successful realization of the large-scale agreement on multilateral specialization and cooperation in production and reciprocal equipment shipments for AES's for 1981-1990 play an important role here. Manufacture of complete reactor units with output of 440 MW has already been developed here and production of a new generation with 1000 MW has begun.

Results and Outlook

The following data indicate how the coordinated strategy of the CEMA member countries which is aimed at economical and efficient use of resources is being implemented.

In the People's Republic of Bulgaria, for example, low-grade lignites are being widely used as fuel for the TET's. The AES "Kozloduy" which was built in cooperation with the USSR has reached rated output (1760 MW).

The percentage of oil in the fuel and energy balance of the Hungarian People's Republic has been reduced from 38.2 percent in 1975 to 35.1 percent in 1980. The 1983 increase in production of electricity in the country will be due to the first block of the Pakshskiy AES which has been put into operation. Because of this and the rise in extraction of low-quality (with lower combustion heat) coal, the proportion of hydrocarbons in total energy consumption in the Hungarian People's Republic will decrease even more.

The role of domestic energy carriers has significantly increased in the GDR as a result of the overfulfillment of planned assignments for including domestic resources in economic turnover, as well as a set of measures for conserving them. The 1981 consumption of high-quality hard coal was reduced by 33 percent as compared to 198, mazut by 15 percent. The percentage of lignite in the primary energy carriers was increased to 67 percent (1980 was 64 percent).

The Socialist Republic of Romania's energy base was developed by intensive GES construction, including microGES's, broader use of solid types of fuel, accelerated realization of the cooperation program for constructing the first AES with rated output of 660 MW, increased percentage of new sources of energy and permanent reduction in consumption of hydrocarbon raw material for energy purposes. As a result, energy generation at GES's in the current 5-year plan will rise by 10 percent, while generation based on liquid fuel will decrease by roughly 27 percent. Industrial and municipal central heating will be further developed. Production consumption and losses in the energy transmitting network will be reduced.

The 80 percent increase in their secondary use will make a considerable contribution to covering the rising needs of the country for energy resources. This and the restoration of products should cover at least 50 percent of the raw material and materials demands in all sectors of the economy.

The 26th CPSU Congress set important tasks in the field of economical and efficient use of resources. One of them is to replace oil with gas and coal in the main spheres of energy production. As before, the large GRES's remain the main "energy plants." Now they are being technically re-equipped and new energy blocks with outputs of 300, 500 and 800 MW are being introduced with supercritical steam parameters. This will significantly reduce fuel consumption. Thus, in 1981 it was 317 g per 1 kW x h at the Kostroma GES, on the whole for the country during the 10th Five-Year Plan it dropped from 340 to 328 g. The calculations show that the decrease in this indicator by 1 g alone for the entire country will conserve up to 1 million T of conventional fuel per year.

The extensive use of water resources is one of the trends for developing Soviet power engineering. A total of 12 million kW of new facilities will be introduced at GES's in 1981-1985. A GAES is being built in the European sector of the country.

Nuclear energy is developing at accelerated rates. Generation of electricity in the 5-year plan at power plants operating on nuclear fuel will almost triple. Power blocks with output from 1 to 1.5 million kW will be installed at the Rostov, Zaporozhye, South Ukrainian, Smolensk, Kalinin, Ignalin, Balakov and other AES's. The percentage of power plants that do not consume organic fuel on the whole will rise roughly from 27 percent in the 10th Five-Year Plan to 35 percent in the 11th.

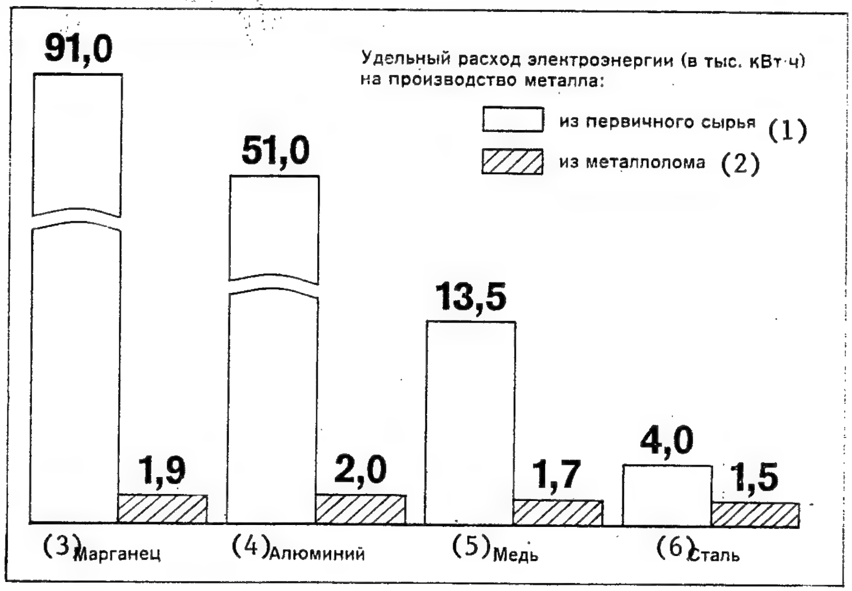
The CSSR is implementing an extended program of nuclear machine construction. It is planned to annually start up at least one reactor with power of 440 MW in the current 10th Year Plan.

The country is reconstructing the entire energy industry. Its tasks are to switch a number of power plants to combined production of electricity and heat and replace mazut and high-quality coal with coal dust and natural gas. The specific fuel consumption for generation of 1 kW x h of electricity should be reduced in 1985 by 14 g as compared to 1980.

Having adopted a course towards maximum utilization of domestic resources, the Czechoslovak power engineers are focusing a lot of attention on the efficient use of small GES's with power of up to 10 MW. This is the cheapest source of energy in the CSSR at present.

Improvement in Industry's Structure

An important area of work to rationalize production consumption in the CEMA member countries is improvement in the sector structure of industry. This means restricted development of energy-intensive sectors, as well as updating of the available technologies. The CSSR, for example, plans to reduce the growth rates of producing products as pig iron, clinker and cement, ferroalloy,



Specific Consumption of Electricity (in thousand kW x h) for Production of Metal

Key:

1. From primary raw material
2. From scrap metal
3. Magnanese
4. Aluminum
5. Copper
6. Steel

ammonia, nitrogen fertilizers and calcium carbide, and at the same time to increase the rates in electronics and microelectronics which have exceptionally low energy intensity. Here there is another aspect to the question: these sectors promote automation of production processes, and at the same time decrease fuel and energy demands.

The set of problems is being solved in other CEMA member countries as well. The role of international specialization and cooperation on a bi- and multilateral basis is especially important here. The large-scale agreements in the field of robot engineering and microelectronics signed at the 36th meeting of the CEMA session have laid the foundations for formation of energy and resource conserving industries in the countries.

Over 60 devices and units which convert solar, geothermal and wind energy have been developed in the framework of the CEMA committee on scientific-technical cooperation.

The Hungarian reserves of thermal water are assessed at 5,000 km^2. It is used to heat 0.7 million m^3 of glass and 1.5 million m^2 of film greenhouses. Eight geothermal plants provide heat and hot water to 3,500 apartments.

Over 80 units of oil are conserved during the year because of the use of energy from one geothermal source which produces 70,000 m^3 of hot water per day.

Scientific-technical progress and the most rapid introduction into production of its achievements is a decisive factor in conservation and economy. The CEMA member countries in this 5-year plan are stressing resource-conserving equipment and the use of technologies which guarantee a decrease in energy- and metal-consumption of products. A lot of attention will be focused on extensive use of low- and waste-free technologies and updating and reconstructing enterprises in order to improve efficiency of equipment.

The current scientific research that is conducted on a joint basis is concentrated on problems of raw material enrichment, the conversion of coal into liquid or gaseous fuel, increasing the carrying capacity of the ground power transmission lines and expanded use of underground alternating current lines based on cryogenic systems and superconducting materials. An important area of the work is to produce accumulated high power energy using electrical and thermomechanical methods, creation of MHD-power plants [magnetohydrodynamic], bringing the work on controllable thermonuclear synthesis to an industrial stage, and more complete utilization of solar, geothermal and wind energy, etc.

Scientific-technical cooperation in these areas also includes a fairly significant number of comprehensive problems of an intersector nature. One can name as an example the creation of experimental-industrial samples of boilers to burn low-quality types of fuel in the fluidized bed. On the basis of the experience in the interested countries, joint developments are underway for a unified series of small-sized highly-forced cyclone furnaces. The energy-technological units that use the cyclone devices require 1.5-fold fewer capital outlays, reduce fuel consumption by 10 percent and emission of harmful substances into the atmosphere by 10-fold. Creation by joint efforts of automated systems for monitoring, calculation and control of the energy industry is very important.

Cooperative work that is coordinated by CEMA sectorial agencies is already yielding a considerable effect. For example, the results of studies on improved planning solutions as well as the use of new materials in hydroelectric power construction are being used to plan underground structures of the GAES "Chayra" and the GES "Devin" in the People's Republic of Bulgaria, concrete and earth dams of the hydrosystems of Nadmarosh in the Hungarian People's Republic, as well as the Dregan and Bredishor GES's in Romania, Toktorul, Ingursk, Nurek, Chirek, Rogunskiy and other GES's in the USSR, and the Gabchikov GES in the CSSR. New anticorrosion materials to protect hydraulic structural surfaces make it possible to reduce outlays for repair by 3-5 fold and increase the service life to 10-12 years.

Joint studies are continuing to introduce coal-containing materials into economic circulation for production of chemical raw materials and to expand the scale of use of wastes from recovery and enrichment of coals in different industrial sectors, especially in the production of construction materials. All of this promotes the use of the available coal reserves and expands the raw material base on these grounds.

By Joint Efforts

The CEMA member countries are also participating in the preparation of measures for efficient use of fuel, energy and raw material in the manufacture of construction materials, glass and ceramics. These measures encompass all the main production stages in the cement industry. The use of rolling mills (instead of turbine) reduces energy consumption to 50 percent and preliminary clinker crushing by 10-20 percent. Labor productivity in this case is increased by as much as 15 percent.

Wastes are an important source of additional raw material and fuel. They are especially important today in blast furnace and steel casting industry, and also at TES's. The fact is that the dumps are continually growing and occupy tens of thousands of hectares.

The recommendations of the CEMA agencies to obtain valuable secondary raw material from them have a large economic effect. In 1981, for example, a unit for enrichment of dump rocks was started up in the dump of the largest steel producer in the GDR, the combine "Stahl and Walzwerk" in Brandenburg. A total of 40,000 T of furnace lining scraps and 130,000 T of slag were processed during the year. Magnesite powder was produced from the refractory material scraps. Fireclay rubble is used in refractory and construction industries, while slag is used to build roads and certain other purposes.

TES wastes are also being included into the economic turnover of the fraternal countries in accordance with the CEMA agency recommendations. This reduces heat consumption in cement production.

Ash is widely used in the GDR national economy. Addition of it to certain grades of concrete increases the strength and elasticity of the construction materials and designs and service life of the buildings and sound-insulating properties of materials. Ash is also widely used in agriculture.

Use of geothermal water and steam which are renewable energy sources promises great savings. Studies to determine the thermo-anomalous areas and to develop methods for using the deep heat are underway in the coordinated program of cooperation in the CEMA member countries.

Hungary has achieved the greatest advances in this area. About 80 percent of thermal water extracted in the country is used in agriculture, the rest is used for communal and industrial central heating needs. Even now 0.7 million m^2 of glass and 1.5 million m^2 of film greenhouses have been constructed with geothermal water heating. Underground heat is also used to warm animal husbandry farms, dry and store agricultural products, etc. Chongrad Oblast, for example, annually grows about 900 T of vegetables on this basis, and Seged heats houses, hospitals and industrial enterprises. According to the specialists' calculations, thermal water heating as compared to gas almost doubles resource conservation. In agriculture alone this will conserve 50,000 T of expensive liquid fuel every year.

The People's Republic of Bulgaria, the Socialist Republic of Romania, the USSR and the CSSR have started to use geothermal water for heating and hot water supply, for therapeutic purposes, for heating greenhouses and animal husbandry complexes, and are conducting experiments on production of electricity.

The research of the scientists indicates that the exhaust heat of industrial and energy facilities can yield a great effect. It is used in the European CEMA member countries to heat greenhouses, dry grain and potatoes, and prepare fodder. In Czechoslovakia, for example, 80 ha of glass and 10 ha of film greenhouses, 15 grain dryers and 2 warehouses with artificial climate will be put into operation before 1990 because of the exhaust heat of the transit gas pipeline. This will conserve mazut of natural gas (200,000 T of conventional fuel per year).

Cooperation of the CEMA member countries for efficient use of resources encompasses all links of the agroindustrial complex, including the food industry. The experience of the dairy industry in the People's Republic of Bulgaria is indicative. Aging of solid cheese in polymer film reduces the drying time fivefold. In the CSSR milling industry, use of the recommendations prepared in the CEMA framework on dry cleaning of wheat conserves 1 m^3 of water and 1 kW x h of electricity for every ton of reprocessed grain. A set of conservation measures in the GDR brewing industry reduced the specific consumption of energy by 18 percent in 1976-1980. The results of improvement in the efficiency of energy management on the whole for the food industry sectors of the GDR annually reduce energy consumption by roughly 3.5 percent.

The production and scientific research collectives of the fraternal countries are continually searching for ways to improve efficiency of production, and to have an economical attitude to all types of material and fuel-energy resources. The Permanent CEMA Commission on Cooperation in the Food Industry has approved a plan for development of scientific-technical ties for 1981-1985. Effective methods for efficient use of cold in the food industry are being formulated according to it. The corresponding equipment is being produced. Technology for producing sugar substitutes from plant raw material is being introduced, and a plan for more complete utilization of secondary energy resources in the sugar industry is being improved. Examination by the interested CEMA member countries of suggestions to build breweries and shops to produce children's nutritional products, reprocess wastes in the sugar, brewing and alcohol sectors, etc is on the agenda.

Implementation of the jointly developed resource-conserving policy means further improvement in the planning and stimulation, monitoring and calculation of conservation of all types of material resources. Increasing demands are consequently made for interaction in the CEMA framework, study and use of the leading experience of the fraternal countries. Deepening cooperation in solving problems of conservation and efficient use of fuel, energy and raw materials, mobilizing existing reserves will promote a rise in the efficiency of social production and growth in the economic potential of each individual country and the socialist community as a whole.

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BRIEFS

SMOLENSK AES START-UP--The first current of the Smolensk AES arrived in the USSR energy system at the end of 1982. The first block with power of 1,000 MW was started up. The Smolensk AES will be the largest of all the nuclear power plants currently under construction in the USSR. After all the units are started up, their total power will reach 7,000 MW. About 1,500 builders, installers and engineers from Poland are participating in the construction of the Smolensk AES. They particularly worked on the setting up of systems of emergency energy supply, reactor cooling and others. Joint erection of the Smolensk AES is not the only example of cooperation. About 1,200 Polish workers, engineers and other specialists are laboring to build the Kursk AES, and about 1,500 to build the Khmelnik AES whose current will also be sent to Poland. [Text] [Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 5, 1983 p 49]
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HUNGARIAN NUCLEAR POWER PLANT--The Paksha AES (Hungarian People's Republic) is a first-born in many respects. None of the nuclear power plants in the CEMA member countries has been built with such broad international division of labor. The practical "breaking-in" of multilateral cooperation of the CEMA member countries in the field of nuclear power engineering has essentially taken place in Paksha. Devices for reloading cassettes with nuclear fuel produced by the Budapest "Gants-Mavaga, automatic devices of another Hungarian enterprise, the EVIG plant have been put into operation next to the Soviet turbines, the reactor from the Czech combine "Shkoda," and the GDR hoist. The Paksha AES will annually conserve about 1.5 million T of expensive liquid fuel for the Hungarian economy. [Text] [Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV in Russian No 5, 1983 p 49] 9035

POLISH AES STABILIZER--The Ratiborski "Rafako" Boiler Production Factory has turned over the first Polish pressure stabilizer for AES's , built at this enterprise, to Soviet specialists. This complex unit weighing 135 T, designed for a 440 MW power block, will be installed at the AES under construction in the GDR. [Text] [Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV in Russian No 5, 1983 p 49] 9035

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